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<110> Pietrokovski, Shmuel
       Amitai, Gil

<120> CHIMERIC AUTOPROCESSING POLYPEPTIDES AND USES THEREOF

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<170> PatentIn version 3.2

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            20                  25                  30


Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Asn
    50                  55                  60


Gln Thr Leu Ile Ser Asn Lys Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65                  70                  75                  80
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Trp Ile Gln Ala Gly Arg Leu Lys Lys Gly·Asp Thr Leu Leu Ser Glu
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Ser Gly Ala Lys Gln Thr Val Gln Asn Ile Thr Leu Lys Xaa Xaa Xaa
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Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
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            20              25              30


Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Asn
    50              55              60


Gln Thr Leu Ile Ser Asn Lys Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65              70              75                      80


Trp Ile Gln Ala Gly Arg Leu Lys Lys Gly Asp Thr Leu Leu Ser Glu
                85              90              95


Ser Gly Ala Lys Gln Thr Val Gln Asn Ile Thr Leu Lys Xaa Xaa Xaa
            100             105             110
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Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
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Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Asn
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65                  70                  75                  80

Trp Ile Gln Ala Gly Arg Leu Lys Lys Gly Asp Thr Leu Leu Ser Glu
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Ser Gly Ala Lys Gln Thr Val Gln Asn Ile Thr Phe Lys Xaa Xaa Xaa
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Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
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Thr Ile Asn Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Asn Ser Leu Asp Phe Phe Val Thr Ala Asp His
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Pro Phe Leu Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65   70   75   80

Xaa Xaa Xaa Xaa Xaa Ala Leu Asn Val Thr Gln Leu Val Ile Gly Asp
                85   90   95

Thr Leu Ile Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            100   105   110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Val Tyr Asn Leu His Leu Ile Gly
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Gly Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50                  55                  60


Xaa Xaa Glu Asp Glu Ser Leu Leu Val Thr Pro Gly His Pro Phe Tyr
65                  70                  75                  80


Val Xaa Xaa Xaa Xaa Xaa Phe Val Pro Val Ile Asp Leu Lys Pro Gly
            85                  90                  95


Asp Arg Leu Gln Ser Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            100                 105                 110


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Lys Thr Tyr Asn
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Gly Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50                  55                  60


Xaa Xaa Ser Ser Glu Thr Leu Glu Val Thr Pro Gly His Pro Phe Tyr
65                  70                  75                  80


Val Xaa Xaa Xaa Xaa Xaa Phe Val Pro Leu Ile Glu Leu Gln Pro Gly
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Asp Arg Leu Gln Ser Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
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Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Arg Thr Tyr Asn
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Gly Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50                  55                  60


Xaa Xaa Glu Gly Glu Thr Leu Leu Val Thr Pro Ser His Pro Phe Tyr
65                  70                  75                  80


Val Xaa Xaa Xaa Xaa Xaa Phe Val Pro Ala Ile Asn Leu Lys Pro Gly
                85                  90                  95


Asp Leu Leu Gln Ser Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            100                 105                 110


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Lys Thr Phe Asn
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Thr Thr Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45


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    50              55              60


Leu Thr Ser Thr Thr His His Pro Tyr Trp Ser Xaa Xaa Xaa Xaa Xaa
65              70              75              80


Trp Lys Asn Ala Gly Asp Leu Glu Ala Gly Asp Thr Leu Arg Thr Pro
            85              90              95


Gln Asn Thr Ala Val Val Ile Ala Ala Thr His Asp Trp Xaa Xaa Xaa
            100             105             110


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Arg Thr Gly Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            35                  40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50                  55                  60

His Gly Gly Val Val Val Ala Thr Asp Ala His Pro Phe Trp Val Xaa
65                  70                  75                  80

Xaa Xaa Xaa Xaa Trp Val Ala Ala Ile Asp Leu Glu Pro Gly Thr Trp
            85                  90                  95

Leu Arg Thr Ser Ala Gly Thr Trp Val Gln Val Arg Ala Val Ala Val
            100                 105                 110

Arg Xaa Xaa Xaa Xaa Xaa Arg Val His Asn Leu Thr Val Ala Asp Leu
            115                 120                 125

His Thr Tyr Tyr Val Xaa Xaa Xaa Xaa Ala Asp Ala Leu Val His Asn
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            20              25              30


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45


Xaa Asn Ser Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser
    50              55              60


Xaa Xaa Xaa Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Ser Arg Leu
65              70              75              80


Leu Ser Glu Ser Gly Lys Thr Gln Thr Val Arg Asn Ile Val Val Lys
            85              90              95


Xaa Xaa Xaa Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr
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Tyr Phe Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His
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            20              25              30
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Ser Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Asn
        50              55                  60

Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65              70                  75                  80

Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Ser Arg Leu Leu Ser Glu
                85                  90                  95

Ser Gly Arg Thr Gln Thr Val Arg Asn Ile Ile Val Lys Xaa Xaa Xaa
            100                 105                 110

Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
        115                 120                 125

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            20                  25                  30

Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
        50              55                  60
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Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65              70              75              80


Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Asn Arg Leu Phe Ala Glu
            85              90              95


Ser Gly Lys Thr Gln Thr Val Arg Asn Ile Val Val Lys Xaa Xaa Xaa
            100             105             110


Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
        115             120             125


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Ile Ala His Ile Gln Ala Gly Asp Arg Val Leu Ser Lys Asp Glu Ala
            20              25              30


Ser Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
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Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
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Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Ser Arg Leu Leu Ser Glu
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Ser Gly Lys Thr Gln Thr Val Arg Asn Ile Val Val Lys Xaa Xaa Xaa
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Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
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       35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
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Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65   70   75   80

Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Ser Arg Leu Phe Ala Glu
       85   90   95

Ser Gly Lys Thr Gln Thr Val Arg Asn Ile Ile Val Lys Xaa Xaa Xaa
       100   105   110

Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
       115   120   125

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Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
    50                  55                  60
```

```
Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65                  70                  75                  80
```

```
Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Ser Arg Leu Leu Ser Glu
            85                  90                  95
```

```
Ser Gly Arg Thr Gln Thr Val Arg Asn Thr Val Val Lys Xaa Xaa Xaa
            100                 105                 110
```

```
Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
        115                 120                 125
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```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His Asn Ser
    130                 135                 140
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<210>  23
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<212>  PRT
<213>  Neisseria meningitidis (group C)
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<400>  23
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Ser Phe His Gly Ser Thr Leu Val Lys Thr Ala Asp Gly Tyr Lys Ala
1               5                   10                  15


Ile Ala His Ile Arg Val Gly Glu Ser Val Phe Ala Lys Asp Glu Thr
            20                  25                  30


Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
        50                  55                  60


Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65                  70                  75                  80


Trp Ile Gln Ala Gly Arg Leu Lys Lys Gly Asp Thr Leu Leu Ser Glu
                85                  90                  95


Ser Gly Ala Lys Gln Thr Val Gln Asn Ile Thr Leu Lys Xaa Xaa Xaa
            100                 105                 110


Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
        115                 120                 125


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His Asn Asp
        130                 135                 140
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<400> 24

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Pro Leu Tyr Val Gly Ala Leu Val Lys Thr Ala Asp Gly Tyr Lys Ala
1               5               10              15


Ile Ala His Ile Arg Val Gly Glu Ser Val Leu Ser Lys Asp Glu Ala
            20              25              30


Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
    50              55              60


Gln Thr Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65              70              75                      80


Trp Ile Gln Ala Gly Arg Leu Lys Lys Gly Asp Thr Leu Leu Ser Glu
                85              90                      95


Ser Gly Ala Lys Gln Thr Val Gln Asn Ile Thr Phe Lys Xaa Xaa Xaa
            100                 105                 110


Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
        115                 120                 125


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His Asn Ala
    130                 135                 140
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<210> 25
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<400>  25

Ser Phe His Gly Ser Thr Leu Val Lys Thr Ala Asp Gly Tyr Lys Ala
1               5                   10                  15


Ile Ala His Ile Arg Val Gly Glu Ser Val Leu Ser Lys Asp Glu Ala
            20                  25                  30


Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
        50                  55                  60


Gln Thr Leu Val Ser Asn Lys Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65                  70                  75                  80


Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Ser Arg Leu Leu Ser Glu
                85                  90                  95


Ser Gly Lys Thr Gln Thr Val Arg Asn Ile Val Val Lys Xaa Xaa Xaa
            100                 105                 110


Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
        115                 120                 125


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His Asn Ala
        130                 135                 140


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<400>  26

Ser Phe His Gly Ser Thr Leu Val Lys Thr Ala Asp Gly Tyr Lys Ala
1               5                   10                  15
```

```
Ile Ala Arg Ile Arg Thr Gly Asp Arg Val Phe Ala Lys Asp Glu Ala
            20                  25              30


Ser Gly Lys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            35                  40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Asn
      50                  55              60


Gln Thr Leu Ile Ser Asn Lys Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65                  70              75                  80


Trp Ile Gln Ala Gly Arg Leu Lys Lys Gly Asp Thr Leu Leu Ser Glu
            85                  90                  95


Ser Gly Ala Lys Gln Thr Val Gln Asn Ile Thr Phe Lys Xaa Xaa Xaa
            100                 105             110


Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
      115                 120             125


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His Asn Ala
      130                 135             140
```

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<210>  27
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<212>  PRT
<213>  Neisseria meningitidis (group C)


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<400>  27
```

```
Ser Phe His Gly Ser Thr Leu Val Lys Thr Ala Asp Gly Tyr Lys Ala
1               5                   10                  15


Ile Ala His Ile Gln Ala Gly Asp Arg Val Leu Ser Lys Asp Glu Ala
            20                  25              30


Ser Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            35                  40              45
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Ser
    50                  55                  60

Gln Thr Leu Val Ser Asn Lys Ile His Pro Phe Tyr Ser Xaa Xaa Xaa
65                  70                  75                  80

Trp Ile Gln Ala Gly Arg Leu Lys Lys Gly Asp Thr Leu Leu Ser Glu
                85                  90                  95

Ser Gly Ala Lys Gln Thr Val Gln Asn Ile Thr Leu Lys Xaa Xaa Xaa
                100                 105                 110

Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr Phe Val
            115                 120                 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His Asn Ser
    130                 135                 140
```

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<210>  28
<211>  164
<212>  PRT
<213>  Mannheimia haemolytica


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<400>  28
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```
Ser Phe His Gly Asp Met Glu Val Lys Thr Asp Lys Gly Tyr Arg Gln
1               5               10                  15

Ile Ser Ser Ile Lys Val Gly Asp Lys Val Leu Ala Lys Asn Glu Arg
                20                  25                  30

Thr Gly Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Lys Tyr
    50                  55                  60

His Thr Ile Val Ser Asn Lys Ile His Pro Phe Phe Thr Xaa Xaa Xaa
65                  70·                 75                  80
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                85                  90                  95


Xaa Xaa Xaa Xaa Xaa Trp Val Asp Ala Gln His Leu Gln Lys Gly Tyr
            100                 105                 110


Arg Leu Leu Ala Glu Ser Gly Glu Trp Gln Thr Val Thr Lys Val Lys
        115                 120                 125


Ile Lys Xaa Xaa Xaa Xaa Lys Ala Tyr Asn Met Thr Val Glu Lys Asp
    130                 135                 140


His Thr Tyr Phe Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp
145                 150                 155                 160


Val His Asn Asp
```

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<210>  29
<211>  136
<212>  PRT
<213>  Clostridium thermocellum


<220>
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<400>  29


Cys Phe Val Ala Gly Thr Leu Ile Leu Thr Val Ala Gly Leu Val Ala
1               5                   10                  15


Ile Glu Asn Ile Lys Ala Gly Asp Lys Val Ile Ala Thr Asn Leu Glu
            20                  25                  30


Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Gly Glu Val Ile Lys Thr
    50                  55                  60


Thr Phe Glu His Pro Phe Tyr Val Xaa Xaa Xaa Xaa Phe Val Glu Ala
65                  70                  75                  80
```

```
Lys Glu Leu Gln Val Gly Asp Lys Leu Leu Asp Ser Lys Gly Asn Val
              85              90              95

Leu Val Val Glu Glu Lys Lys Leu Glu Xaa Xaa Xaa Xaa Xaa Xaa Lys
             100             105             110

Val Tyr Asn Phe His Val Asp Asp Phe Tyr Thr Tyr His Val Xaa Xaa
         115             120             125

Asn Gly Ile Leu Val His Asn Ala
     130             135
```

<210> 30
<211> 136
<212> PRT
<213> Clostridium thermocellum

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<223> Xaa can be any naturally occurring amino acid

<400> 30

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Cys Phe Val Ala Gly Thr Met Val Leu Thr Ala Ala Gly Leu Val Ala
1               5              10              15

Ile Glu Asn Ile Lys Val Gly Asp Lys Val Ile Ala Ala Asn Pro Glu
             20              25              30

Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
         35              40              45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Gly Glu Val Ile Lys Thr
     50              55              60

Thr Val Asp His Pro Phe Tyr Val Xaa Xaa Xaa Xaa Phe Val Glu Ala
65              70              75              80

Val Asn Leu Gln Val Gly Asp Lys Leu Val Asp Ser Lys Gly Asn Val
              85              90              95

Leu Val Val Glu Glu Lys Lys Leu Lys Xaa Xaa Xaa Xaa Xaa Xaa Lys
             100             105             110
```

```
Val Tyr Asn Phe Lys Val Asp Asp Phe His Thr Tyr His Val Xaa Xaa
        115                 120                 125


Lys Gly Ile Leu Val His Asn Ala
    130                 135
```

<210> 31
<211> 136
<212> PRT
<213> Clostridium thermocellum

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<223> Xaa can be any naturally occurring amino acid

<400> 31

```
Cys Phe Val Ala Gly Thr Met Ile Leu Thr Ala Thr Gly Leu Val Ala
1               5                   10                  15


Ile Glu Asn Ile Lys Ala Gly Asp Lys Val Ile Ala Thr Asn Pro Glu
            20                  25                  30


Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Gly Glu Val Ile Lys Thr
    50                  55                  60


Thr Phe Asp His Pro Phe Tyr Val Xaa Xaa Xaa Xaa Phe Val Glu Ala
65                  70                  75                  80


Gly Lys Leu Gln Val Gly Asp Lys Leu Leu Asp Ser Arg Gly Asn Val
                85                  90                  95


Leu Val Val Glu Glu Lys Lys Leu Glu Xaa Xaa Xaa Xaa Xaa Xaa Lys
            100                 105                 110


Val Tyr Asn Phe Lys Val Asp Asp Phe His Thr Tyr His Val Xaa Xaa
        115                 120                 125


Asn Glu Val Leu Val His Asn Ala
    130                 135
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<210> 32

<211> 136
<212> PRT
<213> Clostridium thermocellum

<220>
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<223> Xaa can be any naturally occurring amino acid

<400> 32

```
Cys Phe Val Ala Gly Thr Met Ile Leu Thr Thr Thr Gly Leu Val Ala
1               5                   10                  15


Ile Glu Asn Ile Lys Ala Gly Asp Lys Val Ile Ala Thr Asn Pro Glu
            20                  25                  30


Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Gly Glu Val Ile Lys Thr
    50                  55                  60


Thr Phe Asp His Pro Phe Tyr Val Xaa Xaa Xaa Xaa Phe Val Glu Ala
65                  70                  75                  80


Lys Gln Leu His Val Gly Asp Lys Leu Leu Asp Ser Lys Gly Asn Val
                85                  90                  95


Leu Val Val Glu Asp Lys Lys Ile Lys Xaa Xaa Xaa Xaa Xaa Xaa Lys
            100                 105                 110


Val Tyr Asn Phe Gln Val Ala Asp Phe His Thr Tyr His Val Xaa Xaa
        115                 120                 125


Asn Gly Val Leu Val His Asn Val
    130                 135
```

<210> 33
<211> 136
<212> PRT
<213> Clostridium thermocellum

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<223>  Xaa can be any naturally occurring amino acid


<220>
<221>  misc_feature
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<223>  Xaa can be any naturally occurring amino acid


<400>  33
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Cys Phe Val Ala Gly Thr Met Ile Leu Thr Val Ala Gly Leu Val Ala
1   5   10   15

Ile Glu Asn Ile Lys Ala Gly Asp Lys Val Ile Ala Thr Asn Pro Glu
            20   25   30

Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Gly Asp Val Ile Lys Thr
    50   55   60

Thr Phe Glu His Leu Phe Tyr Ala Xaa Xaa Xaa Xaa Phe Val Glu Ala
65   70   75   80

Lys Glu Leu Gln Val Gly Asp Lys Leu Leu Asp Ser Lys Gly Asn Val
                85   90   95

Leu Val Val Glu Asp Lys Lys Ile Lys Xaa Xaa Xaa Xaa Xaa Xaa Lys
            100   105   110

Val Tyr Asn Phe Gln Val Asp Asp Phe His Thr Tyr His Val Xaa Xaa
        115   120   125

Asn Gly Val Leu Val His Asn Val
    130   135


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<210>  34
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<212>  PRT
<213>  Clostridium thermocellum


<220>
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<220>
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<400>  34
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```
Cys Phe Val Ala Gly Thr Met Ile Leu Thr Ala Thr Gly Leu Val Ala
1               5                   10                  15


Ile Glu Asn Ile Lys Ala Gly Asp Lys Val Ile Ala Thr Asn Pro Glu
            20                  25                  30


Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Xaa Glu Ile Ile Lys Thr
    50                  55                  60


Thr Leu Gly His Leu Phe Tyr Val Xaa Xaa Xaa Xaa Phe Val Glu Ala
65                  70                  75                  80


Val Lys Leu Gln Pro Thr Asp Lys Leu Val Asp Ser Gly Gly Asn Val
                85                  90                  95


Leu Val Val Glu Xaa Lys Lys Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Lys
            100                 105                 110


Val Tyr Asn Phe Lys Val Asn Asp Phe Tyr Thr Tyr His Val Xaa Xaa
        115                 120                 125


Asn Gly Ile Leu Val His Asn Val
    130                 135
```

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<210>  35
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<212>  PRT
<213>  Clostridium thermocellum

<220>
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<400>   35

Cys Phe Val Ala Gly Thr Met Ile Leu Thr Ala Thr Gly Leu Val Ala
1   5   10   15

Ile Glu Asn Ile Lys Ala Gly Asp Lys Val Ile Ala Thr Asn Pro Glu
            20   25   30

Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Xaa Glu Ile Ile Lys Thr
    50   55   60

Thr Leu Gly His Leu Phe Tyr Val Xaa Xaa Xaa Xaa Phe Val Glu Ala
65   70   75   80

Val Lys Leu Gln Pro Thr Asp Lys Leu Val Asp Ser Gly Gly Asn Val
                85   90   95

Leu Val Val Glu Xaa Lys Lys Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Lys
            100   105   110

Val Tyr Asn Phe Lys Val Asn Asp Phe Tyr Thr Tyr His Val Xaa Xaa
        115   120   125

Asn Gly Ile Leu Val His Asn Val
    130   135

<210>   36
<211>   214
<212>   PRT
<213>   Leptospira interrogans

<220>
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<223>   Xaa can be any naturally occurring amino acid

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<400> 36

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Cys Phe Thr Ala Gly Ser Lys Val Thr Lys Leu Lys Asn Phe Ala Asn
1               5                  10                  15


Ile Glu Glu Ile Lys Ile Gly Asp Ile Val Arg Ser Trp Asn Glu Asn
            20                  25                  30


Thr Asn Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Glu Glu Glu Ile His
    50                  55                  60


Thr Thr Trp Asn His Pro Phe Arg Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                85                  90                  95


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            100                 105                 110


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        115                 120                 125


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    130                 135                 140


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Trp Val Lys Val Glu Asp Leu Arg Leu
145                 150                 155                 160


Lys Asp Gln Val Leu Arg Ser Asp Gly Ser Trp Gly Thr Val Thr Gly
                165                 170                 175


Ile Tyr Tyr Tyr Xaa Xaa Xaa Xaa Xaa Lys Val Tyr Asn Leu Glu Val
            180                 185                 190


Glu Asp Asn His Thr Tyr Val Val Xaa Xaa Xaa Xaa Xaa Xaa Ile Gly
        195                 200                 205


Tyr Val Val His Asn Tyr
    210
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<211> 239
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<213> Leptospira interrogans

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<223>  Xaa can be any naturally occurring amino acid

<400>  37

Cys Phe Val Ala Gly Ser Lys Val Thr Lys Leu Lys Asn Xaa Xaa Xaa
1               5                   10                  15


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            20                  25                  30


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Phe Ala Asn Ile Glu Glu
        35                  40                  45


Ile Arg Ile Gly Asp Val Val Arg Ser Trp Asn Glu Asn Thr Asn Thr
    50                  55                  60


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Glu Glu Glu Ile His Thr Thr Trp
                85                  90                  95


Asn His Pro Phe Arg Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            100                 105                 110


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        115                 120                 125


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    130                 135                 140


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
145                 150                 155                 160


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                165                 170                 175


Trp Val Lys Val Glu Asp Leu Arg Leu Arg Asp Gln Val Leu Arg Ser
            180                 185                 190
```

```
Asp Gly Ser Trp Gly Thr Val Thr Gly Ile Tyr Tyr Tyr Xaa Xaa Xaa
        195                 200                 205


Xaa Xaa Lys Val Tyr Asn Leu Glu Val Glu Asp Asn His Thr Tyr Val
    210                 215                 220


Val Xaa Xaa Xaa Xaa Xaa Xaa Lys Gly Tyr Val Val His Asn Tyr
225                     230                 235
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<210>   38
<211>   144
<212>   PRT
<213>   Gemmata obscuriglobus


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<223>   Xaa can be any naturally occurring amino acid

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<223>   Xaa can be any naturally occurring amino acid

<400>   38
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```
Cys Phe Ala Ala Gly Thr Lys Leu Leu Thr Arg Arg Gly Trp Val Ala
1               5                   10                  15


Val Glu Leu Leu Gly Ile Gly Asp Glu Val Ala Ser Arg Thr Glu His
            20                  25                  30


Asp Leu Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Gly Glu Leu Ile
    50                  55                  60


Arg Thr Thr Pro Glu His Pro Phe Trp Val Xaa Xaa Xaa Xaa Trp Thr
65                  70                  75                  80


Ala Ala Gly Ser Leu Ala Ala Gly Asp Arg Ile Ala Thr Xaa Xaa Xaa
                85                  90                  95


Xaa Leu Ser Gly Glu Trp Val Pro Ile Ala Glu Val Phe Asp Thr Xaa
            100                 105                 110
```

```
Xaa Xaa Xaa Pro Val Tyr Asn Leu Arg Val Ala Asp His His Thr Tyr
        115                 120                 125

Phe Val Xaa Xaa Xaa Xaa Xaa Xaa Phe Ala Ala Trp Ala His Asn Ala
    130                 135                 140
```

```
<210>  39
<211>  139
<212>  PRT
<213>  Gemmata obscuriglobus
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<223>  Xaa can be any naturally occurring amino acid
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```
<400>  39
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```
Cys Phe Ala Ser Gly Thr Pro Met Arg Thr Pro Gly Gly Trp Cys Asn
1               5                   10                  15

Ile Glu Asn Leu Arg Val Gly Asp Phe Val Leu Ser Arg Asp Glu Phe
            20                  25                  30

Ser Pro Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Gly Gln Thr Ile Arg
    50                  55                  60

Ser Thr Asp Glu His Pro Phe Phe Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65                  70                  75                      80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85                  90                  95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Thr Val
            100                 105                 110

Tyr Asn Phe Arg Val Ala Asp His His Thr Tyr Phe Val Xaa Xaa Xaa
        115                 120                 125

Xaa Xaa Xaa Phe Ser Val Trp Ala His Asn Ile
    130                 135
```

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<210>  40
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<213>  Pirellula sp.
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<223>  Xaa can be any naturally occurring amino acid

<400>  40

Cys Leu Val Ala Gly Thr Leu Val Trp Thr Asp Arg Gly Met Arg Pro
1               5                   10                  15


Val Glu Ser Leu Arg Leu Gly Asp Gln Val Leu Ser Cys Asp Val Gln
            20                  25                  30


Thr Gly Ser Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Ser Asp Glu Ile Val Ala
    50                  55                  60


Ser Lys Gly His Pro Phe Trp Val Xaa Xaa Xaa Xaa Trp Thr Thr Thr
65                  70                  75                  80


Glu Gln Leu Val Pro Gly Asp Ala Leu His Gly Xaa Xaa Xaa Xaa Xaa
                85                  90                  95


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Lys Thr Tyr Asn Leu
            100                 105                 110


Val Val Glu Gln Thr His Ser Tyr Phe Val Xaa Xaa Ser Arg Ile Leu
        115                 120                 125


Ser His Asp Ala
   130


<210>  41
<211>  144
<212>  PRT
<213>  Streptomyces avermitilis


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<223>   Xaa can be any naturally occurring amino acid

<400>   41
```

Ser Phe Lys Pro Thr Thr Arg Val Leu Met Lys Asp Gly Xaa Thr Lys
1   5   10   15

Pro Leu Gly Lys Ile Lys Pro Gly Asp Leu Val Glu Ala Ala Asp Pro
            20   25   30

Thr Ser Gly His Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50   55   60

Arg Ile Gln Thr Leu His Thr Thr Ala Arg His Arg Ile Trp Asp Xaa
65   70   75   80

Xaa Xaa Xaa Xaa Trp Glu Gln Ala Gly Arg Leu Ile Thr Gly His Lys
                85   90   95

Val Asn Thr Ser Gly Asn Gln His Ala Thr Ile Thr Ser Val Leu Ala
            100   105   110

Gln Xaa Xaa Xaa Xaa Asp Met Tyr Asp Leu Thr Val Glu Gly Leu His
        115   120   125

Thr Tyr Tyr Val Xaa Xaa Xaa Xaa Thr Pro Val Leu Val His Asn Gly
    130   135   140


```
<210>   42
<211>   143
<212>   PRT
<213>   Streptomyces avermitilis


<220>
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<220>
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<221>  misc_feature
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<223>  Xaa can be any naturally occurring amino acid

<400>  42
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```
Cys Phe Leu Ala Gly Thr Asp Ile Leu Met Ala Asp Gly Xaa Thr Lys
1               5                   10                  15


Asp Ile Glu Glu Val Glu Leu Gly Asp Lys Val Gln Ala Thr Asp Pro
            20                  25                  30


Lys Thr Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly
    50                  55                  60


Ala Glu Glu Leu Thr Ala Thr His Glu His Pro Phe Trp Ser Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Trp Ile Thr Ala Gly Ser Leu Glu Pro Gly Met Thr Leu
            85                  90                  95


Leu Thr Asp Asp Gly Asp Thr Val Ile Val Thr Gly Asn Arg Ala Phe
            100                 105                 110


Xaa Xaa Xaa Xaa Thr Thr Tyr Asn Leu Thr Val Asn Asp Leu His Thr
        115                 120                 125


Tyr Tyr Ala Xaa Xaa Xaa Xaa Thr Pro Val Leu Val His Asn Ser
    130                 135                 140
```

```
<210>  43
<211>  146
<212>  PRT
<213>  Streptomyces avermitilis


<220>
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<223>  Xaa can be any naturally occurring amino acid

<400>  43
```

Ser Phe Pro Ala Gly Thr Arg Val Leu Met Gly Asp Gly Xaa Xaa Thr
1   5   10   15

Leu Pro Ile Glu Gln Ile Thr Val Gly Asp Ser Val Leu Ala Thr Asp
            20   25   30

Pro Glu Ala Gly Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        50   55   60

Xaa Xaa Gly Pro Pro Ala Leu Thr Ala Thr Asp Arg His Pro Phe Trp
65   70   75   80

Val Xaa Xaa Xaa Xaa Xaa Trp Ala Asp Ala Arg Asp Leu Asn Ser Gly
                85   90   95

Asp Thr Leu Arg Thr Pro Asp Gly Thr Gly Val Arg Ile Asp Lys Val
            100   105   110

Thr His Trp Xaa Xaa Xaa Xaa Gly Ala Tyr Asn Leu Thr Val Asn Asp
        115   120   125

Leu His Thr Tyr Tyr Val Xaa Xaa Xaa Xaa Val Pro Val Leu Val His
        130   135   140

Asn Ala
145


```
<210>  44
<211>  129
<212>  PRT
<213>  Myxococcus xanthus


<220>
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<223>  Xaa can be any naturally occurring amino acid

<220>
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<222>  (74)..(106)
<223>  Xaa can be any naturally occurring amino acid
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<400> 44

```
Cys Val Ala Pro Trp Glu Leu Val Leu Leu Gly Asp Gly Xaa Glu Val
1               5                   10                  15

Pro Ala Glu Met Leu Arg Pro Gly Met Arg Val Leu Thr Met His Glu
            20              25                  30

His Glu Arg Asp Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Gly Arg Val Leu Val
        50                  55                  60

Val Thr Pro Asp His Arg Trp Arg Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65                  70              75                      80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                85                  90                  95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Val Met Arg Ile Thr
            100                 105             110

Val Arg Phe Ala Met Thr Tyr Ile Val Gln Gly Leu Leu Ala His Asn
        115             120                 125

Leu
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<210> 45
<211> 131
<212> PRT
<213> Myxococcus xanthus

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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

<400> 45

```
Cys Val Ala Pro Trp Glu Pro Val Leu Leu Ser Asp Gly Xaa Glu Val
1               5                   10                  15

Pro Ala Glu Met Leu Arg Pro Gly Met Lys Val Leu Thr Met His Glu
            20              25                  30

His Glu Arg Asp Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45
```

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Gly Arg Ala Val Val
    50   55   60

Val Thr Pro Asp His Arg Trp Arg Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65   70   75   80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85   90   95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Val Met Lys
            100   105   110

Ile Ser Val Arg Phe Ala Lys Thr Tyr Val Val Gln Gly Leu Leu Ala
        115   120   125

His Asn Leu
    130

<210> 46
<211> 137
<212> PRT
<213> Verrucomicrobium spinosum

<220>
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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

<400> 46

Cys Phe Pro Ser Gly Thr Met Val Gln Thr Ala Arg Gly Lys Val Ala
1   5   10   15

Ile Glu Thr Leu Lys Glu Gly Asp Val Val Leu Ala Tyr Asp Phe Leu
            20   25   30

Ser Glu Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Ser Lys Ile Ser Ala
    50   55   60

Thr Arg Phe His Leu Phe Trp Val Xaa Xaa Xaa Xaa Xaa Trp Val Pro
65   70   75   80

```
Ala Val Asp Leu Gln Pro Gly Met Val Leu Arg Leu Glu Ser Gly Ala
                85              90              95
```

```
Leu Thr Val Val Thr Leu Ala Lys Leu Arg Xaa Xaa Xaa Xaa Xaa Xaa
            100             105             110
```

```
Ala Thr His Asn Phe Glu Val Ala Asp Leu His Asn Tyr Phe Val Xaa
        115             120             125
```

```
Xaa Gln Gly Phe Leu Val His Asn Gly
    130             135
```

```
<210>  47
<211>  140
<212>  PRT
<213>  Verrucomicrobium spinosum
```

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<223>  Xaa can be any naturally occurring amino acid
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```
<400>  47
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```
Cys Phe Pro Ala Gly Thr Met Val Leu Met Ala Asp Gly Xaa Ser Val
1               5               10              15
```

```
Pro Ile Glu Gln Val Val Glu Gly Asp Ile Val Leu Ala Ala Glu Pro
            20              25              30
```

```
Glu Thr Glu Ser Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Thr Gly Ser Val
    50              55              60
```

```
Leu Lys Val Thr Gly Glu His Pro Ile Trp Thr Xaa Xaa Xaa Xaa Trp
65              70              75              80
```

```
Gln His Ala Asp Asp Leu Val Glu Gly Asp Leu Leu Leu Lys Xaa Xaa
                85              90              95
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
          100                 105                 110
```

```
Xaa Asp Thr Phe Asn Leu Cys Val Glu Gly Val His Thr Phe Tyr Val
        115                 120                 125
```

```
Xaa Xaa Xaa Xaa Asp Ala Val Leu Val His Asn Thr
    130                 135                 140
```

```
<210>   48
<211>   145
<212>   PRT
<213>   Verrucomicrobium spinosum
```

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<220>
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<223>   Xaa can be any naturally occurring amino acid
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<220>
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<222>   (134)..(137)
<223>   Xaa can be any naturally occurring amino acid
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```
<400>   48
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```
Cys Phe Ala Pro Gly Thr Pro Val Leu Met Gly Asp Gly Xaa Thr Arg
1               5                   10                  15
```

```
Pro Val Glu Thr Ile Arg Glu Gly Asp Trp Ile Met Ala Asp Asp Pro
            20                  25                  30
```

```
Glu Asp Glu Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35                  40                  45
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50                  55                  60
```

```
Xaa Xaa Pro Asp Gly Ala Leu Lys Ala Thr Gly Gly His Pro Phe Trp
65                  70                  75                  80
```

```
Thr Xaa Xaa Xaa Xaa Trp Ile Lys Val Cys Asn Leu Gln Pro Asn Asp
                85                  90                  95
```

```
Ile Leu Ala Asp Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        100                 105                 110
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Ala Thr Tyr Asn Leu Ser Val Ala Asn Ile
        115                 120             125

His Thr Phe Phe Val Xaa Xaa Xaa Xaa Val Pro Val Leu Val His Asn
    130             135             140

Thr
145
```

```
<210>   49
<211>   141
<212>   PRT
<213>   Gloeobacter violaceus


<220>
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<220>
<221>   misc_feature
<222>   (132)..(133)
<223>   Xaa can be any naturally occurring amino acid

<400>   49
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```
Cys Phe Ala Glu Gly Thr Glu Val Gln Thr Glu Thr Gly Thr Lys Ala
1               5                   10                  15

Ile Glu Lys Val Glu Pro Gly Glu Lys Val Leu Ala Arg Asn Glu Lys
            20              25              30

Thr Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50              55                  60

Glu Arg Asp Thr Leu Thr Val Thr Gly Glu His Pro Phe Phe Leu Xaa
65              70                  75                  80

Xaa Xaa Xaa Trp Thr Ala Ala Glu Arg Leu Arg Ser Gly Glu Arg Val
            85              90                  95

Gln Ala Val Asp Gly Lys Trp Leu Arg Val Val Gly Leu Gln Pro Gln
            100             105             110

Xaa Xaa Xaa Xaa Arg Thr Tyr Asn Leu Glu Val Glu Gly Glu His Thr
        115             120             125
```

```
Phe Phe Val Xaa Xaa Thr Arg Ala Trp Val His Asn Glu
    130                 135             140
```

```
<210>   50
<211>   141
<212>   PRT
<213>   Gloeobacter violaceus
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```
<220>
<221>   misc_feature
<222>   (132)..(133)
<223>   Xaa can be any naturally occurring amino acid
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```
<400>   50
```

```
Cys Phe Ala Glu Gly Thr Glu Val Gln Thr Glu Thr Gly Ala Lys Pro
1               5                   10              15
```

```
Ile Glu Leu Val Ala Pro Gly Glu Lys Val Leu Ala Arg Asn Glu Gln
            20              25              30
```

```
Thr Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50              55              60
```

```
Asp Arg Asp Val Leu Thr Val Thr Gly Glu His Pro Phe Phe Leu Xaa
65              70              75              80
```

```
Xaa Xaa Xaa Trp Thr Ala Ala Asp Lys Leu Gln Val Gly Glu Arg Val
            85              90              95
```

```
Gln Thr Val Asp Gly Gln Trp Leu Arg Val Ala Gly Leu Gln Ala Gln
            100             105             110
```

```
Xaa Xaa Xaa Xaa Arg Thr Tyr Asn Leu Glu Val Glu Arg Asp His Thr
        115             120             125
```

```
Phe Phe Val Xaa Xaa Ser Lys Ala Trp Val His Asn Glu
    130             135             140
```

```
<210>   51
<211>   141
<212>   PRT
<213>   Gloeobacter violaceus
```

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<220>
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<220>
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<220>
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<222>  (113)..(116)
<223>  Xaa can be any naturally occurring amino acid

<220>
<221>  misc_feature
<222>  (132)..(133)
<223>  Xaa can be any naturally occurring amino acid

<400>  51
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Cys Phe Ser Glu Gly Thr Glu Val Gln Thr Glu Ala Gly Ala Lys Pro
1   5   10   15

Ile Glu Leu Val Glu Pro Gly Glu Lys Val Leu Ala Arg Asn Glu Gln
            20   25   30

Thr Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50   55   60

Glu Arg Asp Thr Leu Thr Val Thr Gly Glu His Pro Phe Phe Leu Xaa
65   70   75   80

Xaa Xaa Xaa Trp Thr Ala Ala Glu Arg Leu Lys Ser Gly Glu Arg Val
            85   90   95

Gln Ala Ala Asp Gly Lys Trp Leu Arg Val Ala Gly Leu Glu Ala Gln
            100   105   110

Xaa Xaa Xaa Xaa Arg Thr Tyr Asn Leu Glu Val Glu Gly Asp His Thr
    115   120   125

Phe Phe Val Xaa Xaa Asn Gln Ala Trp Val His Asn Glu
    130   135   140


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<210>  52
<211>  139
<212>  PRT
<213>  Chromobacterium violaceum


<220>
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<400> 52

Cys Phe Val Ala Gly Thr Gln Val Leu Thr Asp Lys Gly Leu Lys Ala
1   5   10   15

Ile Glu Thr Phe Val Gly Gly Glu Trp Val Trp Ser Arg Ser Asp Gln
            20   25   30

Thr Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Arg Gln
    50   55   60

Glu Thr Phe Arg Thr Thr Ala Glu His Pro Phe Trp Val Xaa Xaa Xaa
65   70   75   80

Xaa Trp Leu Lys Ala Ser Leu Leu Gln Ala Gly Val Ile Leu Val Asp
            85   90   95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            100   105   110

Xaa Xaa Thr Val Phe Asn Ile Gln Val Ala Glu Phe Gln Thr Tyr His
        115   120   125

Val Xaa Xaa Leu Gly Val Trp Val His Asn Ala
    130   135

<210> 53
<211> 141
<212> PRT
<213> Gloeobacter violaceus

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<223> Xaa can be any naturally occurring amino acid

<400> 53

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Cys Phe Ala Glu Gly Thr Glu Val Gln Thr Glu Thr Gly Thr Lys Ala
1               5                   10                  15

Ile Glu Lys Val Glu Pro Gly Glu Lys Val Leu Ala Arg Asn Glu Lys
                20              25                  30

Thr Gly Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        50              55                  60

Glu Arg Asp Thr Leu Thr Val Thr Gly Glu His Pro Phe Phe Leu Xaa
65                  70                  75                  80

Xaa Xaa Xaa Trp Thr Ala Ala Asp Lys Leu Gln Ala Gly Asp Arg Val
            85              90                  95

Gln Ala Val Asp Gly Arg Trp Leu Arg Val Val Gly Leu Ala Ala Gln
            100             105                 110

Xaa Xaa Xaa Xaa Arg Thr Tyr Asn Leu Glu Ile Glu Gly Glu His Thr
        115             120                 125

Phe Phe Val Xaa Xaa Asn Gln Ala Trp Val His Asn Glu
        130             135             140
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<210> 54
<211> 93
<212> PRT
<213> Gloeobacter violaceus

<220>
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<400> 54

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Cys Phe Gly Glu Gly Thr Ala Val Gln Thr Glu Thr Arg Ala Lys Pro
1               5                   10                  15

Ile Glu Gln Ile Glu Pro Gly Glu Lys Val Leu Ala Arg Ser Glu Arg
                20              25                  30

Thr Gly Gln Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        50              55                  60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Arg
65                  70                  75                  80
```

```
Asp Thr Ser Thr Val Thr Gly Glu His Pro Phe Tyr Leu
                85                  90
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<210>  55
<211>  81
<212>  PRT
<213>  Neisseria meningitidis (group C)
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<223>  Xaa can be any naturally occurring amino acid
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<400>  55
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```
Asn Ser Gln Ile Leu Ile Ser Asn Arg Ile His Pro Phe Tyr Ser Xaa
1               5                  10                  15
```

```
Xaa Xaa Trp Ile Lys Ala Glu Asp Leu Lys Ala Gly Ser Arg Leu Leu
            20                  25                  30
```

```
Ser Glu Ser Gly Lys Thr Gln Thr Val Arg Asn Ile Val Val Lys Xaa
        35                  40                  45
```

```
Xaa Xaa Xaa Lys Ala Tyr Asn Leu Thr Val Ala Asp Trp His Thr Tyr
    50                  55                  60
```

```
Phe Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Gly Val Trp Val His Asn
65                  70                  75                  80
```

```
Asp
```

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<210>  56
<211>  91
<212>  PRT
<213>  Clostridium thermocellum
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<400>  56
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```
Cys Phe Val Ala Gly Thr Met Ile Leu Thr Ala Thr Gly Leu Val Ala
1               5                  10                  15
```

```
Ile Glu Asn Ile Lys Ala Gly Asp Lys Val Ile Ala Thr Asn Pro Glu
            20              25              30


Thr Phe Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Gly Glu Val Ile Lys Thr
    50              55              60


Thr Phe Glu His Pro Phe Tyr Val Xaa Xaa Xaa Xaa Phe Val Glu Ala
65              70              75              80


Gly Lys Leu Gln Ile Gly Asp Arg Leu Val Asp
                85              90
```

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<210>  57
<211>  45
<212>  PRT
<213>  Clostridium thermocellum


<220>
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<220>
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<400>  57
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Ser Lys Gly Asn Val Leu Val Val Glu Glu Lys Lys Leu Glu Xaa Xaa
1               5               10              15


Xaa Xaa Xaa Xaa Lys Val Tyr Asn Phe Lys Val Asn Asp Phe His Thr
            20              25              30


Tyr His Val Xaa Xaa Asp Gly Ile Leu Val His Asn Ala
        35              40              45
```

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<210>  58
<211>  24
<212>  PRT
<213>  Clostridium thermocellum


<220>
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<400>  58
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```
Val Tyr Asn Phe Lys Val Asp Asn Phe His Thr Tyr His Val Xaa Xaa
1               5               10              15


Asn Arg Val Leu Val His Asn Ala
            20
```

```
<210>  59
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```
<211>  39
<212>  PRT
<213>  Clostridium thermocellum


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<400>  59

Phe Val Lys Glu Met Lys Leu Gln Pro Gly Asn Arg Leu Val Asp Xaa
1               5                   10                  15


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            20                  25                  30


Xaa Xaa Lys Val Tyr Asn Phe
        35


<210>  60
<211>  63
<212>  PRT
<213>  Leptospira interrogans


<220>
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<400>  60

Trp Val Lys Val Glu Asp Leu Arg Leu Arg Asp Gln Val Leu Arg Ser
1               5                   10                  15


Asp Gly Ser Trp Gly Thr Val Thr Gly Ile Tyr Tyr Tyr Xaa Xaa Xaa
            20                  25                  30


Xaa Xaa Lys Val Tyr Asn Leu Glu Val Glu Asp Asn His Thr Tyr Ile
        35                  40                  45


Val Xaa Xaa Xaa Xaa Xaa Xaa Ile Gly Tyr Val Val His Asn Tyr
    50                  55                  60


<210>  61
<211>  10
<212>  PRT
<213>  Gloeobacter violaceus

<400>  61

Cys Phe Ala Glu Gly Thr Glu Val Gln Thr
1               5                   10


<210>  62
<211>  15
<212>  PRT
<213>  Gloeobacter violaceus
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<400> 62

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Trp Thr Ala Ala Glu Arg Leu Glu Pro Gly Asp Arg Val Gln Ala
1               5                   10                  15
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<210> 63
<211> 153
<212> PRT
<213> Rhodobacter capsulatus

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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

<400> 63

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Cys Phe Thr Pro Gly Thr Leu Ile Asp Thr Pro Ala Gly Pro Arg Pro
1               5                   10                  15

Val Glu Ala Leu Arg Pro Gly Asp Arg Val Ser Thr Arg Asp Xaa Xaa
            20              25              30

Xaa Gln Glu Ile Leu Trp Ile Gly Ser Arg Arg Met Xaa Xaa Xaa Xaa
        35              40              45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Arg Leu Gly Ala Val Arg
    50              55              60

Leu Gly Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65              70                  75                  80

Ala Ala Asp Leu Leu Val Ser Pro Gln His Arg Val Leu Val Xaa Xaa
            85                  90                  95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Val Gln Ala
            100             105             110

Cys Asp Leu Val Asp Asp Ala Ala Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        115             120             125
```

```
Xaa Val Thr Tyr Leu His Leu Leu Phe Ala Arg His Gln Val Ile Arg
    130                 135                 140
```

```
Ala Asn Gly Val Glu Thr Glu Ser Phe
145                 150
```

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<210> 64
<211> 141
<212> PRT
<213> Rhodobacter capsulatus
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<400> 64
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Gly Phe Tyr Gly Glu Thr Val Leu Gln Thr Ala Arg Gly Leu Arg Arg
1               5               10              15
```

```
Val Ser Ser Ile Leu Glu Gly Glu Lys Met Arg Thr Phe Thr Xaa Xaa
            20              25              30
```

```
Xaa Ala Pro Val Leu Ser Ile Glu Arg Phe Ala Leu Xaa Xaa Xaa Xaa
        35              40              45
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Leu Ser Leu Pro Ala Gly Leu
    50              55              60
```

```
Phe Gly Xaa Thr Arg Asn Arg Phe Val Ala Pro Glu Gln Cys Leu Leu
65              70              75              80
```

```
Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Leu Leu
            85              90              95
```

```
Val Pro Ala Lys Val Leu Gly Leu Leu Pro Gln Val Xaa Xaa Xaa Xaa
            100             105             110
```

```
Xaa Xaa Xaa Xaa Ala Val Leu Tyr Arg Leu Leu Phe Glu Arg Pro Glu
        115                 120                 125


Leu Val Val Thr Asp Xaa Gly Ala Val Met Leu Cys Asp
    130                 135                 140
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<210> 65
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<213> Rhodobacter capsulatus

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<400> 65

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Gly Phe Ala Ala Gly Thr Arg Val Arg Thr Pro Ala Gly Leu Arg Arg
1               5                   10              15


Ile Glu Thr Leu Lys Pro Gly Asp Leu Val Glu Thr Gln Glu Xaa Xaa
            20              25              30


Xaa Gln Pro Val Val Ala Val Glu Arg Thr Arg Leu Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Pro Ile Arg Phe Ala Ala Gly Ala His Gly Xaa Glu Arg
    50              55              60


Pro Val Leu Val Ala Pro Gln Gln Arg Val Leu Val Xaa Xaa Xaa Xaa
65              70              75              80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Val Ala Ala Arg Thr
                85              90              95


Leu Val Asp Gly Glu Met Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Asp
            100             105             110


Tyr Val Arg Leu Val Phe Asp Cys Ala His Met Val Phe Ala Glu Gly
        115             120             125
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Leu Ala Val Glu Cys Phe
    130

<210> 66
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<213> Rhodobacter capsulatus

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<400> 66

Cys Phe Ala Pro Ser Thr Pro Ile Ala Thr Pro Gly Gly Asp Cys Pro
1   5   10   15

Ala Ala Ser Leu Lys Ala Gly Asp Leu Val Leu Thr Ala Asp Xaa Xaa
            20   25   30

Xaa Gln Pro Ile Leu Trp Ser Gly Arg Ile Ala Leu Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Pro Val Arg Leu Cys Ala Pro Ala Phe Gly Xaa Thr Arg
    50   55   60

Asp Leu Trp Val Leu Pro Gln His Arg Val Ala Leu Xaa Xaa Xaa Xaa
65   70   75   80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Val Pro Ala His His
                85   90   95

Leu Val Asp Gly Ile Ser Ala Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu
            100   105   110

Ser Trp His Gly Leu Leu Leu Gln Gly His His Leu Leu Ile Ala Asp
        115   120   125

Gly Cys Arg Val Glu Ser Leu
    130   135

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<210>   67
<211>   135
<212>   PRT
<213>   Rhodobacter capsulatus


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<223>   Xaa can be any naturally occurring amino acid

<400>   67
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Cys Phe Thr Ala Gly Thr Leu Ile Glu Thr Pro Arg Gly Pro Val Pro
1   5   10   15

Val Glu Ser Leu Arg Ala Gly Asp Leu Val Val Thr Arg Asp Xaa Xaa
            20   25   30

Xaa Val Pro Val Leu Trp Ser Gly Gly Arg Ser Leu Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Ala Ile Arg Glu Asn Ala
    50   55   60

Leu Gly Xaa His Gly Ala Leu Leu Leu Ser Pro Gln His Ala Val Leu
65   70   75   80

Ala Xaa Xaa Xaa Xaa Xaa Glu Arg Leu Val Arg Ala Arg His Leu Ala
            85   90   95

Gly Leu Asn Asp Pro Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val
            100   105   110

Ser Tyr His His Ile Leu Leu Glu Arg His Gly Ile Val Thr Ala Asn
            115   120   125

Gly Leu Ala Cys Glu Ser Leu
        130   135


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<210>   68
<211>   146
<212>   PRT
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<213> Rhodobacter capsulatus

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<223> Xaa can be any naturally occurring amino acid

<400> 68

Ala Leu Ala Arg Gly Ser Val Leu Met Thr Glu Asp Gly Pro Val Ala
1   5   10   15

Ile Glu Asp Leu Gln Pro Gly Gln Gly Val Leu Thr Ala Glu Xaa Xaa
            20   25   30

Xaa Glu Arg Val Cys Trp Ile Gly Ser Met Val Ile Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Thr Arg Ile Thr
    50   55   60

Ala Glu Ala Phe Gly Xaa Xaa Xaa Xaa Ala Leu Asp Leu Val Leu Gly
65   70   75   80

Pro Arg Ala Arg Leu Cys Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85   90   95

Xaa Xaa Xaa Ala Ala Asp Val Pro Ala Arg Ala Phe Leu Asp Gly Ile
            100   105   110

Ser Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Thr Val Tyr His Val
        115   120   125

Val Leu Glu Gln His Gly Ser Leu Arg Val Ala Gly Leu Glu Val Glu
    130   135   140

Ala Phe
145

<210> 69
<211> 136
<212> PRT

<213>   Rhodobacter capsulatus

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<220>
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<223> Xaa can be any naturally occurring amino acid

<400> 69

Cys Leu Gly Thr Gly Thr Met Ile Ala Thr Ala Glu Gly Pro Ala Pro
1   5   10   15

Ile Asp Trp Leu Arg Pro Gly Asp Arg Val Leu Thr Arg Asp Xaa Xaa
            20   25   30

Xaa Gln Pro Leu Leu Trp Val Gly Gln His Thr Met Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Pro Leu Leu Leu Ser Ala Ala Cys Phe Gly Xaa
    50   55   60

Xaa Xaa Xaa Glu Arg Asp Val Leu Leu Ser Pro Gly Thr Gly Val Leu
65   70   75   80

Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Met Phe
        85   90   95

Ala Lys Ala Arg His Ala Leu Pro Lys Ala Glu Ala Xaa Xaa Xaa Xaa
            100   105   110

Gln Lys Leu Tyr Ser Met Leu Leu Ala Thr Pro Glu Val Val Leu Ala
        115   120   125

Glu Gly Met Trp Val Gly Ser Val
    130   135

<210> 70
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<213> Rhodobacter capsulatus

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<220>
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<400>  70

Cys Phe Ala Ala Gly Thr Leu Ile Ala Thr Arg Arg Gly Pro Lys Pro
1               5                   10                  15


Val Glu Asp Leu Gly Pro Glu Asp Arg Leu Gln Thr Ser Asp Xaa Xaa
            20                  25                  30


Xaa Arg Pro Val Gln Trp Val Gly Arg Trp Arg Val Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Pro Val Arg Phe Ala Pro Gly Val Leu Gly Xaa Asp Arg
    50                  55                  60


Ala Leu Phe Leu Ser Gly Gln His Arg Val Leu Ile Xaa Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Val Ala Ala Lys Ala Leu Val
                85                  90                  95


Gly Leu Pro Gly Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Asp Trp Val
            100                 105                 110


His Val Met Met Pro Thr His Glu Val Ile Phe Ala Glu Asn Ala Arg
        115                 120                 125


Ala Glu Thr Met
    130


<210>  71
<211>  135
<212>  PRT
<213>  Rhodobacter capsulatus


<220>
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<400>  71

Ala Phe Thr Thr Gly Thr Leu Ile Thr Met Ala Gly Gly Xaa Gln Arg
1               5                   10                  15


Pro Ile Glu Thr Leu Ala Pro Gly Asp Arg Val Leu Thr Arg Asp Xaa
            20                  25                  30


Xaa Xaa Gln Pro Val Arg Leu Val Ala Arg Ala Thr Leu Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Pro Val Val Ile Ser Ala Gly Thr Leu Gly Xaa Glu
    50                  55                  60


Ser Asp Leu Val Val Ala Pro His His Arg Val Phe Leu Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Ile Leu Val Gln Ala Lys
                85                  90                  95


His Leu Val Asp Gly Glu His Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val
            100                 105                 110


Asp Tyr Phe Ala Leu Val Phe Asp Arg His Glu Ile Val Tyr Ala Glu
        115                 120                 125


Gly Val Pro Val Glu Ser Leu
    130                 135


<210>  72
<211>  139
<212>  PRT
<213>  Rhodobacter capsulatus


<220>
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<400>  72
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Cys Phe Thr Ala Thr Ser Leu Ile Ala Thr Gly Gln Gly Gly Val Pro
1               5                   10                  15


Val Ser Glu Leu Val Pro Gly Ala Arg Val Ile Thr Arg Asp Xaa Xaa
            20              25                  30


Xaa Gln Glu Leu Leu Trp Val Gly Arg Arg Arg Phe Xaa Xaa Xaa Xaa
        35              40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Arg Ile Ala Ala Gly Ala
    50                  55                  60


Leu Gly Xaa Xaa Xaa Xaa Glu Arg Asp Met Leu Val Ser Pro Asn His
65                  70                  75                  80


Arg Phe Leu Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Arg Leu
                85                  90                  95


Thr Met Ala Arg Asp Leu Val Gly Leu Asp Gly Ile Xaa Xaa Xaa Xaa
            100             105             110


Xaa Xaa Xaa Val Asp Tyr Trp Gln Leu Leu Phe Ala His His Glu Leu
        115             120             125


Val Leu Ala Asp Gly Ala Trp Ser Glu Ser Phe
    130             135
```

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<210>  73
<211>  142
<212>  PRT
<213>  Rhodobacter capsulatus


<220>
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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

<400> 73

```
Cys Leu Thr Pro Gly Thr Leu Ile Glu Thr Lys Arg Gly Gln Val Pro
1               5                   10                  15

Val Glu Lys Leu Arg Pro Gly Asp Arg Val Leu Thr Arg Asp Xaa Xaa
            20              25                  30

Xaa Gln Pro Ile Arg Trp Ile Gly Arg Arg Arg Leu Xaa Xaa Xaa Xaa
        35              40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Arg Ile Ala Ala Gly Ala
    50                  55                  60

Leu Gly Xaa Xaa Xaa Xaa Glu Thr Asp Met Leu Val Ser Pro Gln His
65                  70                  75                  80

Arg Met Leu Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85                  90                  95

Glu Val Leu Ala Ala Ala Leu His Met Leu Gly Gln Pro Gly Ile Xaa
            100             105             110

Xaa Xaa Xaa Xaa Xaa Xaa Val Thr Tyr Leu His Leu Met Leu Asp Ala
        115             120             125

His Glu Ile Ile Arg Ala Asn Gly Ala Trp Thr Glu Ser Phe
    130             135             140
```

<210> 74
<211> 136
<212> PRT
<213> Rhodobacter capsulatus

<220>
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<220>
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<220>
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<220>
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<223>   Xaa can be any naturally occurring amino acid

<400>   74
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Cys Leu Val Ala Gly Ser Arg Val Ser Thr Pro Arg Gly Pro Val Pro
1   5   10   15

Val Glu Asp Leu Arg Pro Glu Asp Leu Val Thr Val Arg Asp Xaa Xaa
            20   25   30

Xaa Leu Pro Val Leu Trp Ile Gly Arg Arg Arg Val Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Glu Ile Gly Ala Gly Arg
    50   55   60

Leu Gly Xaa Ala Ala Pro Val Arg Leu Ser Ala Leu His Gly Ile Ala
65   70   75   80

Val Xaa Xaa Gly Phe Leu Ala Arg Ala Gly His Leu Ala Ala Thr Gly
            85   90   95

Trp Gly Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            100   105   110

Val Leu Tyr Leu His Leu Leu Leu Pro Arg His Ala Leu Leu Ser Val
        115   120   125

Glu Gly Leu Trp Val Glu Ser Phe
    130   135

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<210>   75
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<212>   PRT
<213>   Rhodobacter capsulatus


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<223>   Xaa can be any naturally occurring amino acid

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<223>   Xaa can be any naturally occurring amino acid

<220>
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<221>  misc_feature
<222>  (102)..(108)
<223>  Xaa can be any naturally occurring amino acid


<400>  75

Gly Phe Ala Met Gly Ser Arg Val Ala Thr Met Asp Gly Leu Leu Pro
1               5               10              15


Val Glu Phe Leu Asn Leu Gly Asp Arg Ile Val Thr Arg Ser Xaa Xaa
            20              25              30


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Val
        35              40              45


Gly Ile Ala Pro Gly Ala Leu Gly Xaa Xaa Xaa Xaa Gly Gln Ala Met
    50              55              60


Val Leu Gly Ser Gly Thr Gln Val Leu Leu Xaa Xaa Xaa Xaa Xaa Xaa
65              70              75              80


Xaa Xaa Xaa Xaa Xaa Xaa Gln Ala Leu Val Ala Val Glu Arg Leu Ile
            85              90              95


Asp Gly Gln Phe Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Ile Arg Ile Phe
            100             105             110


Ala Leu His Phe Glu Ala Pro Glu Val Ile Tyr Ala Asp Gly Val Glu
        115             120             125


Ile Gly Cys Lys
    130


<210>  76
<211>  142
<212>  PRT
<213>  Rhodobacter sphaeroides


<220>
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<223>  Xaa can be any naturally occurring amino acid

<220>
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<222>  (112)..(118)
<223>  Xaa can be any naturally occurring amino acid
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<400> 76

```
Cys Phe Thr Pro Gly Thr Leu Ile Ala Thr Val Arg Gly Glu Val Ala
1               5                   10                  15

Val Glu Ala Leu Ala Ala Gly Asp Arg Ile Val Thr Arg Asp Xaa Xaa
            20                  25                  30

Xaa Gln Pro Leu Arg Trp Ile Ser Arg Arg Arg Leu Xaa Xaa Xaa Xaa
        35                  40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Leu Ile Glu Lys Gly Ser
    50                  55                  60

Leu Gly Xaa Xaa Xaa Xaa Asp Arg Asp Met Met Val Ser Pro Asn His
.65                 70                  75                  80

Arg Ile Leu Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                85                  90                  95

Glu Val Leu Val Ala Ala Lys His Leu Val Gly Pro Arg Gly Ile Xaa
            100                 105                 110

Xaa Xaa Xaa Xaa Xaa Xaa Thr Thr Tyr Leu His Leu Met Phe Asp Arg
        115                 120                 125

His Glu Val Val Leu Ala Asn Gly Ala Trp Thr Glu Ser Phe
    130                 135                 140
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<210> 77
<211> 133
<212> PRT
<213> Rhodobacter sphaeroides

<220>
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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (103)..(109)
<223> Xaa can be any naturally occurring amino acid

<400> 77

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Ser Leu Thr Ala Gly Thr Pro Val Leu Thr Leu Ala Gly Ile Arg Pro
1               5                   10                  15

Ala Glu Gly Ile Arg Pro Gly Asp Arg Leu Val Ala Arg Ser Xaa Xaa
            20                  25                  30
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Met
        35                  40                  45


Val Ala Ile Gly Ala Ser Thr Leu Ala Xaa Xaa Xaa Xaa Asp Glu Thr
    50                  55                  60


Leu Leu Val Pro Ala Asp Gln Pro Leu Leu Leu Xaa Xaa Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Val Leu Pro Ala Arg Arg Leu
                85                  90                  95


Val Asp Gly Gln Leu Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Asp Leu
            100                 105                 110


Val Thr Leu Thr Phe Ala Ala Pro Ala Ala Ile Tyr Ala Ser Glu Leu
        115                 120                 125


His Pro Val Thr Arg
    130


<210>   78
<211>   132
<212>   PRT
<213>   Brucella suis


<220>
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<223>   Xaa can be any naturally occurring amino acid

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<223>   Xaa can be any naturally occurring amino acid

<220>
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<223>   Xaa can be any naturally occurring amino acid

<400>   78

Cys Leu Leu Lys Gly Thr Leu Val Thr Thr Pro Asn Gly Pro Val Ala
1               5                   10                  15


Val Glu Lys Leu Cys Val Gly Asp Leu Val Thr Thr Val Ser Xaa Xaa
            20                  25                  30


Xaa Leu Pro Ile Lys Trp Ile Gly Trp Gln Asn Tyr Xaa Xaa Xaa Xaa
        35                  40                  45
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Ile Arg Val Arg Arg His Ala
    50                  55              60

Leu Asp Xaa Xaa Xaa Xaa His Arg Asp Leu Tyr Leu Ser Pro Asn His
65              70              75                      80

Ala Leu Phe Ile Xaa Gly Val Leu Ile Arg Val Lys Asp Leu Val Asn
                85              90                  95

Gly Arg Ser Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Asp Tyr Tyr
            100             105             110

Asn Ile Val Leu Asp Arg His Ala Val Val Leu Ala Glu Gly Ala Ala
        115             120             125

Val Glu Thr Phe
    130


<210>   79
<211>   132
<212>   PRT
<213>   Brucella melitensis


<220>
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<223>   Xaa can be any naturally occurring amino acid

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<223>   Xaa can be any naturally occurring amino acid

<220>
<221>   misc_feature
<222>   (101)..(108)
<223>   Xaa can be any naturally occurring amino acid

<400>   79

Cys Leu Leu Lys Gly Thr Leu Val Thr Thr Pro Asn Gly Pro Val Ala
1               5               10                  15

Val Glu Lys Leu Cys Val Gly Asp Leu Val Thr Thr Val Ser Xaa Xaa
            20              25              30

Xaa Leu Pro Ile Lys Trp Ile Gly Trp Gln Asn Tyr Xaa Xaa Xaa Xaa
        35              40              45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Ile Arg Val Arg Arg His Ala
    50                  55              60
```

```
Leu Asp Xaa Xaa Xaa Xaa His Arg Asp Leu Tyr Leu Ser Pro Asn His
65              70              75              80


Ala Leu Phe Ile Xaa Gly Val Leu Ile Arg Val Lys Asp Leu Val Asn
                85              90              95


Gly Arg Ser Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Asp Tyr Tyr
            100             105             110


Asn Ile Val Leu Asp Arg His Ala Val Val Leu Ala Glu Gly Ala Ala
        115             120             125


Val Glu Thr Phe
    130


<210>  80
<211>  138
<212>  PRT
<213>  Unknown

<220>
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<220>
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<220>
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<220>
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<222>  (107)..(114)
<223>  Xaa can be any naturally occurring amino acid

<400>  80

Cys Phe Leu Pro Gly Thr Met Ile Lys Thr Pro Ser Gly Glu Arg Pro
1               5               10              15


Val Glu Asp Ile Gln Ile Asn Asp Glu Val Ile Thr Phe Asp Xaa Xaa
            20              25              30


Xaa Xaa Xaa Xaa Xaa Xaa Ser Lys Ile Lys Trp Val Gly Ser Lys Thr
            35              40              45


Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val
    50              55              60
```

```
Arg Ile Leu Lys Asn Ala Ile Ser Xaa Xaa Xaa Xaa His Lys Asp Leu
65              70          75              80


Leu Val Thr Pro Glu His Cys Leu Phe Phe Xaa Gly Lys Phe Ile Pro
                85              90              95


Val Arg Met Leu Val Asn His Gln Thr Ile Xaa Xaa Xaa Xaa Xaa Xaa
            100             105             110


Xaa Xaa Tyr Thr Tyr Tyr His Ile Glu Thr Glu Asn His Ser Val Ile
        115             120             125


Tyr Ser Asp Gly Met Leu Thr Glu Ser Tyr
    130             135
```

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<210>   81
<211>   138
<212>   PRT
<213>   Unknown

<220>
<223>   BIL2 domain sequence from an unknown origin


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<220>
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<223>   Xaa can be any naturally occurring amino acid

<220>
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<223>   Xaa can be any naturally occurring amino acid

<220>
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<223>   Xaa can be any naturally occurring amino acid

<220>
<221>   misc_feature
<222>   (107)..(114)
<223>   Xaa can be any naturally occurring amino acid

<400>   81
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```
Cys Phe Leu Ser Gly Thr Gln Ile Lys Thr Lys Leu Gly Val Lys Asn
1               5           10              15


Ile Glu Ala Leu Gln Val Gly Asp Phe Val Thr Thr Tyr Asp Xaa Xaa
            20              25              30


Xaa Xaa Xaa Xaa Xaa Xaa Arg Glu Val Thr Trp Val Gly Xaa Lys Tyr
        35              40              45
```

```
Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val
    50              55              60

Arg Ile Val Lys Asp Ala Ile Ala Xaa Xaa Xaa Xaa Tyr Lys Asp Leu
65              70              75                      80

Leu Val Thr Ala Glu His Cys Leu Phe Phe Xaa Asp Lys Phe Ile Pro
                85                  90                  95

Ala Arg Met Leu Val Asn Gly Ser Thr Ile Xaa Xaa Xaa Xaa Xaa Xaa
            100             105             110

Xaa Xaa Tyr Glu Tyr Tyr His Leu Glu Thr Gln Asp His Ala Val Ile
        115             120             125

Ile Ala Asp Gly Val Arg Thr Glu Ser Tyr
    130             135
```

```
<210>  82
<211>  138
<212>  PRT
<213>  Methylobacterium extorquens


<220>
<221>  misc_feature
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<220>
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<223>  Xaa can be any naturally occurring amino acid

<220>
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<223>  Xaa can be any naturally occurring amino acid

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<223>  Xaa can be any naturally occurring amino acid

<220>
<221>  misc_feature
<222>  (108)..(114)
<223>  Xaa can be any naturally occurring amino acid

<400>  82
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```
Cys Phe Thr Thr Gly Thr Leu Ile Arg Thr Ala Arg Gly Ser Val Ala
1               5                   10                  15

Val Glu Asp Leu Ile Val Gly Asp Leu Ala Val Thr Ala Ser Xaa Xaa
            20              25              30

Xaa Arg Pro Ile Thr Trp Ile Gly Asn Arg Ala Leu Xaa Xaa Xaa Xaa
        35              40              45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Ile Arg Ile Arg Ala Gly Ala
    50              55              60
```

```
Phe Gly Xaa Xaa Xaa Xaa Ala Arg Asp Leu Arg Leu Ser His Gly His
65              70              75              80


Pro Val Leu Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Val Leu Val
            85              90              95


Pro Val Met Cys Leu Ile Asn Gly Thr Ser Val Xaa Xaa Xaa Xaa Xaa
        100             105             110


Xaa Xaa Val Thr Tyr Trp His Ile Glu Leu Asp Ala His Asp Ile Leu
        115             120             125


Leu Ala Glu Gly Leu Ala Ala Glu Ser Tyr
    130             135
```

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<210>  83
<211>  142
<212>  PRT
<213>  Silicibacter pomeroyi


<220>
<221>  misc_feature
<222>  (31)..(33)
<223>  Xaa can be any naturally occurring amino acid

<220>
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<223>  Xaa can be any naturally occurring amino acid

<220>
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<220>
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<222>  (112)..(118)
<223>  Xaa can be any naturally occurring amino acid

<400>  83
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```
Cys Phe Thr Pro Gly Thr Lys Ile Ala Thr Pro Lys Gly Glu Arg Leu
1               5               10              15


Val Glu Asp Leu Glu Val Gly Asp Arg Val Ile Thr Arg Asp Xaa Xaa
            20              25              30


Xaa Gln Glu Ile Arg Trp Val Gly Ser Arg Thr Leu Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Leu Ile Arg Gln Gly Ala
    50              55              60


Leu Gly Xaa Xaa Xaa Xaa Glu Arg Asp Met Ile Val Ser Pro Asn His
65              70              75              80
```

```
Arg Ile Leu Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
                85                  90                  95


Glu Val Leu Val Ala Ala Lys His Leu Ile Gly Leu Glu Gly Val Xaa
            100             105              .  110


Xaa Xaa Xaa Xaa Xaa Xaa Val Thr Tyr Ile His Phe Met Phe Asp Gln
        115             120             125


His Glu Val Val Leu Ser Asp Gly Ala Trp Thr Glu Ser Phe
    130             135             140
```

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<210>   84
<211>   134
<212>   PRT
<213>   Silicibacter pomeroyi


<220>
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<223>   Xaa can be any naturally occurring amino acid

<220>
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<222>   (104)..(110)
<223>   Xaa can be any naturally occurring amino acid

<400>   84
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```
Cys Phe Cys Arg Gly Thr Leu Ile Ala Thr Ala Gly Gly Glu Ile Pro
1               5               10                  15


Val Glu Lys Leu Arg Pro Gly Asp Arg Val Ile Thr Arg Asp Xaa Xaa
            20              25              30


Xaa Gln Arg Ile Arg Trp Ile Gly Gly Thr Ser Arg Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Pro Ile Arg Ile Arg Thr Gly Val Leu Lys Xaa Thr Arg
    50              55              60


Asp Leu Leu Val Ser Pro Asn His Arg Ile Leu Met Xaa Xaa Xaa Xaa
65              70              75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Val Ala Ala Lys Phe
            85              90                  95
```

```
Leu Val Asp Gly Arg Ala Ile Xaa Xaa Xaa Xaa Xaa Xaa Val Asp
            100             105             110

Tyr Tyr His Met Leu Phe Asp Gln His Glu Leu Val Leu Ser Glu Gln
        115             120             125

Ala Trp Ser Glu Ser Phe
    130
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<210> 85
<211> 134
<212> PRT
<213> Silicibacter pomeroyi

<220>
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<220>
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<223> Xaa can be any naturally occurring amino acid

<220>
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<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (77)..(88)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
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<223> Xaa can be any naturally occurring amino acid

<400> 85

```
Cys Phe Ala Ala Gly Thr Arg Ile Glu Thr Asp Arg Gly Gly Arg Ala
1               5               10              15

Ile Glu Asp Ile Ala Val Gly Asp Leu Val Leu Thr Arg Asp Xaa Xaa
            20              25              30

Xaa Gln Pro Val Arg Trp Thr Gly Arg Arg Ser Val Xaa Xaa Xaa Xaa
        35              40              45

Xaa Xaa Xaa Pro Ile Arg Ile Ala Ser Gly Lys Leu Gly Xaa Leu Arg
    50              55              60

Asp Leu Leu Val Ser Pro Gln His Arg Leu Leu Leu Xaa Xaa Xaa Xaa
65              70              75              80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Ala Ala Ala Val His
            85              90              95

Leu Arg Asp Asp Arg His Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Thr
            100             105             110
```

```
Tyr Val His Leu Met Phe Asp Arg His Glu Ile Ile Tyr Ala Glu Gly
        115                 120                 125


Val Ala Ser Glu Ser Phe
    130
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<210> 86
<211> 143
<212> PRT
<213> Silicibacter pomeroyi

<220>
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<222> (31)..(33)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (45)..(56)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (67)..(70)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (85)..(96)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (112)..(119)
<223> Xaa can be any naturally occurring amino acid

<400> 86

```
Cys Phe Thr Pro Gly Thr Arg Ile Ala Thr Pro Thr Gly Pro Arg Leu
1               5               10              15


Ile Glu Glu Leu Arg Glu Gly Asp Lys Val Gln Thr Arg Asp Xaa Xaa
            20              25              30


Xaa Gln Glu Ile Gln Trp Ile Gly Gln Arg Arg Met Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Ile Arg Met Arg Val Gly Ala
    50              55              60


Leu Gly Xaa Xaa Xaa Xaa Asp Ala Glu Leu Leu Val Ser Pro Glu His
65              70              75              80


Arg Met Leu Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85              90              95


Glu Val Leu Val Pro Ala Arg Asp Leu Val Asn Asp Ser Thr Ile Xaa
            100             105             110


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Thr Tyr Val His Leu Leu Leu Pro
        115             120             125
```

```
Ser His Gln Ile Leu Trp Ala Asn Gly Ile Glu Thr Glu Ser Phe
    130                 135             140
```

```
<210>  87
<211>  134
<212>  PRT
<213>  Silicibacter pomeroyi


<220>
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<222>  (31)..(33)
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<220>
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<220>
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<220>
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<222>  (77)..(88)
<223>  Xaa can be any naturally occurring amino acid

<220>
<221>  misc_feature
<222>  (104)..(110)
<223>  Xaa can be any naturally occurring amino acid

<400>  87
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```
Cys Phe Ala Ala Gly Thr Phe Ile Glu Ile Glu Ser Gly Pro Ile Pro
1               5               10              15
```

```
Val Glu Thr Leu Arg Pro Gly Asp Leu Val Gln Thr Leu Asp Xaa Xaa
            20              25              30
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Xaa Gln Pro Leu Leu Gln Leu Ala Lys Thr Thr Val Xaa Xaa Xaa Xaa
        35              40              45
```

```
Xaa Xaa Xaa Pro Val Leu Phe Arg Ala Gly Val Leu Gly Xaa Phe Arg
    50              55              60
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```
Asp Leu Tyr Val Ser Gln Gln His Arg Met Leu Ile Xaa Xaa Xaa Xaa
65              70              75              80
```

```
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Phe Val Pro Ala Arg Met
            85              90              95
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```
Leu Val Asn Gly Ser Thr Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Thr
            100             105             110
```

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Tyr Tyr His Leu Leu Phe Ala Arg His Glu Ile Val Phe Ser Glu Gly
        115             120             125
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Ile Pro Thr Glu Ser Tyr
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Cys Phe Val Ala Gly Thr Leu Ile Asp Thr Pro Tyr Gly Glu Arg Gln
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Val Glu Arg Leu Thr Pro Gly Asp Gln Val Phe Thr Arg Asp Xaa Xaa
            20                  25                  30


Xaa Gln Glu Val Arg Trp Val Gly Glu Arg Thr Val Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Pro Ile Leu Ile Arg Ala Gly Thr Tyr Gly Xaa Gln Arg
    50                  55                  60


Asp Leu Met Val Ser Pro Gln His Arg Ile Leu Ile Xaa Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Val Ala Ala Lys Asp
                85                  90                  95


Leu Val Asp Gly Arg Arg Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Ile Thr
            100                 105                 110


Tyr Val His Val Met Phe Asp Ser His Gln Val Ile Tyr Ser Glu Gly
        115                 120                 125


Leu Ala Ser Glu Ser Phe
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<210>  89
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<400>  89

Ser Leu His Pro Glu Thr Pro Ile Ala Thr Pro Asp Gly Tyr Arg Pro
1               5                   10                  15


Leu Ser Lys Ile Arg Arg Gly Asp Thr Val Ile Val Ala Ser Xaa Xaa
            20                  25                  30


Xaa Val Pro Val Leu His Arg Val Ser Arg Thr Met Xaa Xaa Xaa Xaa
            35                  40                  45


Xaa Xaa Xaa Pro Leu Thr Ile Arg Arg Pro Tyr Phe Gly Xaa Arg Gln
        50                  55                  60


Asp Ile Gln Ala Ala Pro Ser Gln Arg Leu Leu Leu Xaa Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Ser Val Leu Val Pro Ala Arg His
                85                  90                  95


Leu Thr Gly Gly His Ser Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Ala
            100                 105                 110


Thr Tyr Ala Gln Leu Leu Leu Pro Thr Asn Glu Ala Met Ile Thr Ala
            115                 120                 125


Gly Ala Leu Ala Glu Ser Leu
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1               5                   10                  15


Val Glu Thr Leu Ala Val Gly Asp Leu Val Pro Val Glu Asp Xaa Xaa
            20                  25                  30


Xaa Gln Pro Ile Leu Trp Ile Gly Lys Arg Thr Leu Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Arg Ile Arg Arg Asp Ala
    50                  55                  60


Leu Gly Xaa Xaa Xaa Xaa His Arg Thr Leu Trp Val Ser Pro Gln His
65                  70                  75                  80


Arg Ile Val Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85                  90                  95


Gln Val Phe Ala Ala Ala Ile His Leu Thr Asn Asp Asp Thr Ile Xaa
            100                 105                 110


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Thr Tyr Tyr His Leu Ala Phe Glu
        115                 120                 125


Arg His Leu Leu Leu Arg Ala His Gly Leu Leu Ser Glu Ser Ile
    130                 135                 140
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Cys Phe Thr Pro Gly Thr Leu Ile Ala Thr Ala His Gly Pro Arg Ala
1               5                   10                  15


Ile Glu Thr Leu Arg Pro Gly Asp Leu Ile Val Thr Arg Asp Xaa Xaa
                20              25                  30


Xaa Gln Pro Leu Arg Trp Val Gly Ser Arg Thr Val Xaa Xaa Xaa Xaa
        35              40                  45


Xaa Xaa Xaa Pro Ile Arg Leu Asp Pro Thr Leu Leu Gln Xaa Xaa Ser
    50              55                  60


Ala Pro Leu Leu Val Ser Pro Gln His Arg Met Leu Trp Xaa Xaa Xaa
65              70              75                      80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Val Leu Val Ala Ala Thr
                85                  90                  95


His Leu Leu Gly Ser Pro Ala Ala Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val
            100             105                 110


Thr Tyr Met His Leu Met Leu Asp Arg His Glu Val Ile Tyr Ala Asn
        115                 120                 125


Asp Ala Ala Thr Glu Ser Phe
    130                 135



<210>  92
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Cys Phe Thr Pro Gly Thr Ile Ile Asp Thr Glu Asp Gly Pro Arg Leu
1               5                   10                  15


Ile Glu Glu Leu Gln Pro Gly Asp Leu Ile Arg Thr Leu Asp Xaa Xaa
            20              25                  30


Xaa Gln Pro Leu Arg Trp Ile Gly Arg Thr Thr Val Xaa Xaa Xaa Xaa
        35              40                  45


Xaa Xaa Xaa Pro Val Leu Ile Arg Ala Gly Ala Leu Asp Xaa Arg Arg
    50              55                  60


Asp Leu Ile Val Ser Pro Gln His Arg Met Leu Ile Xaa Xaa Xaa Xaa
65              70              75                      80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gln Ala Leu Val Ala Ala Lys His
            85                  90                  95


Leu Val Asn Ala Arg Asp Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Thr
            100             105             110


Tyr Ile His Leu Leu Phe Asp Arg His Glu Ile Ile Trp Ala Glu Gly
        115             120                 125


Cys Pro Thr Glu Ser Phe
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Cys Phe Ala Ala Gly Thr Arg Ile Ala Thr Pro Lys Gly Ala Arg Pro
1               5                   10                  15


Val Glu Thr Leu Ala Val Gly Asp Leu Val Gln Thr Leu Asp Xaa Xaa
            20                  25                  30


Xaa Gln Pro Ile Arg Trp Ile Gly Thr Arg Arg Val Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Val Ile Pro Ala His Ser
    50                  55                  60


Phe Ala Xaa Xaa Xaa Xaa Thr His Pro Leu Leu Leu Ser Gln Gln His
65                  70                  75                  80


Arg Val Leu Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85                  90                  95


Glu Ile Leu Ile Ala Ala Arg Arg Leu Thr Gly Leu His Gly Ile Xaa
            100                 105                 110


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val Arg Tyr Ile His Phe Ala Leu Asp
        115                 120                 125


Arg His Glu Ile Val Phe Ala Asn Gly Leu Pro Ala Glu Thr Leu
    130                 135                 140


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Ser Phe Thr Arg Gly Thr His Ile Thr Leu Gly Ser Gly Xaa Gln Val
1               5                   10                  15


Arg Ile Glu Asp Leu Lys Val Gly Asp Arg Val Leu Thr Arg Asp Xaa
            20                  25                  30


Xaa Xaa Arg Glu Val Arg Trp Ile Gly Gln Thr Thr Val Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Pro Ile Val Ile Arg Ala Gly Thr Leu Asn Xaa Glu
    50                  55                  60


Asn Asp Leu Val Val Ser Pro Asp His Arg Leu Phe Val Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Glu Leu Leu Leu Lys Ala Arg
            85                  90                  95


His Leu Val Asn Gly Asp Thr Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Val
            100                 105                 110


Asp Tyr Phe Gln Leu Leu Phe Asp Arg His His Ile Ile Tyr Ala Glu
        115                 120                 125


Gly Ile Ala Ala Glu Thr Met
    130                 135
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<400>  95
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Ala Phe Ser Arg Gly Ser Leu Ile Asp Thr Asp Cys Gly Pro Met Ala
1               5                   10                  15

Ile Glu Asp Leu Leu Pro Gly Asp Arg Val Ile Thr Gln Asp Xaa Xaa
            20              25                  30

Xaa Gln Glu Val Val Trp Lys Gly Ser Thr Val Ile Xaa Xaa Xaa Xaa
        35              40                  45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Thr Arg Ile Met Ala Asp
    50                  55                  60

Ala Phe Gly Xaa Xaa Xaa Xaa Met Ser Gly Val Ile Ala Gly Pro Ser
65              70              75                  80

Ala Arg Leu Leu Ala Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            85              90                  95

Xaa Pro Met Leu Thr Pro Val Gln His Phe Val Asp Gly Met Gly Ile
        100                 105                 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Ile Glu Val Phe His Ile Cys Leu
        115                 120                 125

Arg Arg His Ala Val Ile Asn Val Asp Gly Leu Gln Phe Glu Thr Tyr
    130                 135                 140
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<400>  96
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Gly Leu Pro Ala Gly Thr Met Leu Glu Thr Glu Ala Gly Trp Ser Pro
1               5               10              15

Val Glu Glu Ile Arg Pro Gly Thr Arg Val Ala Thr Ile Asp Xaa Xaa
            20              25              30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
        35              40              45

Xaa Leu Trp Arg Ile Pro Gly Gly Thr Leu Gly Xaa Cys Ser Asp Leu
    50              55              60

Leu Leu Pro Glu Gly His Phe Leu Ala Leu Xaa Xaa Xaa Xaa Xaa Xaa
65              70              75              80

Xaa Xaa Xaa Xaa Xaa Xaa Thr Val Leu Ala Pro Val Ala Ala Leu Ala
            85              90              95

Gly Phe Glu Gly Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Pro Ala His
        100             105             110

Ser Leu Arg Phe Ala Glu Glu Glu Val Val Trp Ala Gln
        115             120             125
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<400>   97
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Gly Phe Leu Ala Gly Thr Ile Leu Leu Thr Gln Asp Gly Glu Met Pro
1               5               10              15

Val Glu Phe Leu Ser Pro Gly Asp Arg Ile Ile Thr Arg Asp Xaa Xaa
            20              25              30
```

Xaa Val Pro Leu His His Ile Thr Arg Ala Pro Gln Xaa Xaa Xaa Ala
        35   40   45

Ile Arg Ile Ala Ala Gly Ser Leu Gly Xaa Xaa Xaa Xaa Asp Cys Asp
    50   55   60

Leu Ile Leu Pro Ala Gly Gln Pro Val Leu Ile Xaa Xaa Xaa Xaa Xaa
65   70   75   80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gln Ala Met Val Arg Ala Asp Ala Leu
            85   90   95

Val Asp Gly Glu Phe Ile Xaa Xaa Xaa Xaa Xaa Xaa Met Gln Leu
            100   105   110

Phe Gln Leu His Phe Asp Ser Ala His Val Leu Tyr Ala Gly
        115   120   125

<210> 98
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Gly Leu Leu Ala Gly Thr Ser Val Ala Ser Asn Phe Gly Trp Gln Pro
1   5   10   15

Val Glu Ala Leu Lys Val Gly Asp Lys Val Leu Thr Phe Asp Xaa Xaa
            20   25   30

Xaa Gln Thr Val Ala Asp Ile Gln Arg Glu Thr Val Xaa Xaa Xaa Xaa
        35   40   45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Arg Leu Pro Glu Gly Val Cys
    50   55   60

```
His Xaa Arg Arg Asp Leu Trp Met Met Pro Asp Gln Gly Leu Leu Val
65              70              75              80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Tyr Ala Val Val
                85              90              95


Pro Ala Arg Met Leu Arg Gly Tyr Arg Gly Ile Xaa Xaa Xaa Xaa Xaa
            100             105             110


Xaa Xaa Xaa Val Glu Val Thr Thr Leu Ala Phe His Gln Asp Glu Val
        115             120             125


Ile Tyr Val Glu
    130
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<210>   99
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<400>   99
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Cys Phe Leu Arg Gly Thr Ala Ile Leu Thr Asp Cys Gly Glu Lys Pro
1               5               10              15


Val Glu Asn Leu Ser Ile Gly Asp Arg Val Ala Leu Pro Asp Xaa Xaa
            20              25              30


Xaa Arg Pro Ile Lys Trp Val Gly Arg Gln Ser Phe Xaa Xaa Xaa Xaa
        35              40              45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Ile Arg Val Ser Arg His Ala
    50              55              60


Leu Asp Xaa Xaa Xaa Xaa His Ser Asp Leu Tyr Leu Ser Pro Gly His
65              70              75              80
```

```
Ala Leu Tyr Leu Xaa Gly Ile Leu Ile Gln Val Lys Asp Leu Val Asn
              85              90              95

Gly Lys Thr Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Ile Glu
          100              105              110

Tyr Tyr Ala Val Met Leu Asp Thr His Glu Val Ile Leu Ala Gly Gly
        115              120              125

Ala Glu Thr Glu Ser Phe
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<210> 100
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<400> 100

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Cys Tyr Val Thr Gly Thr Arg Ile Arg Thr Glu Arg Gly Glu Ile Ala
1               5               10              15

Val Glu Asp Leu Gln Val Gly Asp Phe Ala Val Thr Ala Ser Xaa Xaa
              20              25              30

Xaa Arg Pro Ile Thr Trp Ile Gly His Arg Glu Ile Xaa Xaa Xaa Xaa
        35              40              45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Arg Val Arg Ala Gly Ala
    50              55              60

Phe Gly Xaa Xaa Xaa Xaa Val Asn Asp Leu Phe Leu Ser Pro Gly His
65              70              75              80

Pro Val Leu Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Val Leu Val
              85              90              95
```

```
Pro Val Met Cys Leu Ile Asn Gly Thr Thr Ile Xaa Xaa Xaa Xaa Xaa
            100                 105             110


Xaa Xaa Val Thr Tyr Trp His Val Glu Leu Asp Ala His Asp Ile Leu
        115                 120                 125


Leu Ala Glu Gly Leu Pro Ala Glu Ser Tyr
    130                 135
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<210>  101
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<400>  101
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Cys Phe Val Ser Gly Thr Arg Ile Ser Val Glu Arg Gly Ser Ile Pro
1               5               10                  15


Val Glu Leu Leu Arg Ile Gly Glu Lys Ala Arg Leu Ala Ser Xaa Xaa
            20                  25                  30


Xaa Arg Thr Ile Thr Trp Ile Gly His Arg Glu Ile Xaa Xaa Xaa Xaa
        35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Val Arg Val Arg Ala Gly Ala
    50                  55                  60


Phe Gly Xaa Xaa Xaa Xaa Ala Arg Asp Leu Phe Leu Ser Pro Gly His
65                  70                  75                  80


Pro Val Leu Ile Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Val Leu Val
            85                  90                  95


Pro Val Met Cys Leu Ile Asn Gly Thr Ser Ile Xaa Xaa Xaa Xaa Xaa
            100                 105             110
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Xaa Xaa Val Thr Tyr Trp His Val Glu Leu Asp Arg His Asp Ile Leu
        115                 120                 125

Leu Ala Glu Gly Leu Pro Ala Glu Ser Tyr
    130                 135
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<210> 102
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<212> PRT
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Cys Phe Val Thr Gly Thr Met Ile Ala Thr Ala Arg Gly Glu Val Ala
1               5                   10                  15

Val Glu Asp Leu Arg Ala Gly Asp Phe Ala Arg Thr Ala Glu Xaa Xaa
                20                  25                  30

Xaa Arg Pro Ile Val Trp Ile Gly His Arg Glu Ile Xaa Xaa Xaa Xaa
        35                  40                  45

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Phe Gly Xaa Xaa Xaa Xaa Ala Arg Asp Leu Tyr Leu Ser Pro Gly His
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Pro Val Leu Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Thr Leu Val
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Pro Ile
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            20                  25                  30


Xaa His Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
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Xaa Xaa Xaa Xaa Xaa Xaa His Xaa Xaa
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                20                  25                  30


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
            35                  40                  45


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
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Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65                  70                  75                  80


Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
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Gly Gly Lys Pro Phe Ala Ala Ala Ile Leu Ala Thr His Ile Arg Thr
            35                  40                  45
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Asp Gln Pro Ile Tyr Arg Leu Lys Leu Lys Gly Lys Gln Glu Asn Gly
    50   55   60

Gln Ala Glu Asp Glu Ser Leu Leu Val Thr Pro Gly His Pro Phe Tyr
65   70   75   80

Val Pro Ala Gln His Gly Phe Val Pro Val Ile Asp Leu Lys Pro Gly
                85   90   95

Asp Arg Leu Gln Ser Leu Ala Asp Gly Ala Ser Glu Asn Thr Ser Ser
            100   105   110

Glu Val Glu Ser Leu Glu Leu Tyr Leu Pro Val Gly Lys Thr Tyr Asn
        115   120   125

Leu Thr Val Asp Val Gly His Thr Phe Tyr Val Gly Lys Leu Lys Thr
    130   135   140

Trp Val His Asn Thr
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<210> 108
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Gly Ile Lys Val Thr Val Glu His Pro Asp Lys Leu Glu Glu Lys Phe
        35   40   45

Pro Gln Val Ala Ala Thr Gly Asp Gly Pro Asp Ile Ile Phe Trp Ala
    50   55   60

His Asp Arg Phe Gly Gly Tyr Ala Gln Ser Gly Leu Leu Ala Glu Ile
65   70   75   80

Thr Pro Asp Lys Ala Phe Gln Asp Lys Leu Tyr Pro Phe Thr Trp Asp
                85   90   95

Ala Val Arg Tyr Asn Gly Lys Leu Ile Ala Tyr Pro Ile Ala Val Glu
            100   105   110

Ala Leu Ser Leu Ile Tyr Asn Lys Asp Leu Leu Pro Asn Pro Pro Lys
        115   120   125

Thr Trp Glu Glu Ile Pro Ala Leu Asp Lys Glu Leu Lys Ala Lys Gly
    130   135   140

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Leu Ile Ala Ala Asp Gly Gly Tyr Ala Phe Lys Tyr Glu Asn Gly Lys
                165             170             175

Tyr Asp Ile Lys Asp Val Gly Val Asp Asn Ala Gly Ala Lys Phe Leu
            180             185             190

Val Asp Leu Ile Ala Gly Leu Thr Lys Asn Lys His Met Asn Ala Asp
        195             200             205

Thr Asp Tyr Ser Ile Ala Glu Ala Ala Phe Asn Lys Gly Glu Thr Ala
    210             215             220

Met Thr Ile Asn Gly Pro Trp Ala Trp Ser Asn Ile Asp Thr Ser Lys
225             230             235             240

Val Asn Tyr Gly Val Thr Val Leu Pro Thr Phe Lys Gly Gln Pro Ser
            245             250             255

Lys Pro Phe Val Gly Val Leu Ser Ala Gly Ile Asn Ala Ala Ser Pro
            260             265             270

Asn Lys Glu Leu Ala Lys Glu Phe Leu Glu Asn Tyr Leu Leu Thr Asp
    275             280             285

Glu Gly Leu Glu Ala Val Asn Lys Asp Lys Pro Leu Gly Ala Val Ala
    290             295             300

Leu Lys Ser Tyr Glu Glu Glu Leu Ala Lys Asp Pro Arg Ile Ala Ala
305             310             315             320

Thr Met Glu Asn Ala Gln Lys Gly Glu Ile Met Pro Asn Ile Pro Gln
            325             330             335

Met Ser Ala Phe Trp Tyr Ala Val Arg Thr Ala Val Ile Asn Ala Ala
            340             345             350

Ser Gly Arg Gln Thr Val Asp Glu Ala Leu Lys Asp Ala Gln Thr Asn
        355             360             365

Ser Ser Ser Asn Asn Asn Asn Asn Asn Asn Asn Asn Leu Gly Ile
        370             375             380

Glu Gly Arg Ile Ser Glu Phe Gly Ser Thr Ser Arg Val Asp Cys Gly
385             390             395             400

Gly Leu Thr Gly Leu Asn Ser Gly Leu Thr Thr Asn Pro Gly Val Ser
            405             410             415

Ala Trp Gln Val Asn Thr Ala Tyr Thr Ala Gly Gln Leu Val Thr Tyr
            420             425             430
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Asn Gly Lys Thr Tyr Lys Cys Leu Gln Pro His Thr Ser Leu Ala Gly
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Trp Glu Pro Ser Asn Val Pro Ala Leu Trp Gln Leu Gln
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Gly Ile Lys Val Thr Val Glu His Pro Asp Lys Leu Glu Glu Lys Phe
      35   40   45

Pro Gln Val Ala Ala Thr Gly Asp Gly Pro Asp Ile Ile Phe Trp Ala
    50   55   60

His Asp Arg Phe Gly Gly Tyr Ala Gln Ser Gly Leu Leu Ala Glu Ile
65   70   75   80

Thr Pro Asp Lys Ala Phe Gln Asp Lys Leu Tyr Pro Phe Thr Trp Asp
          85   90   95

Ala Val Arg Tyr Asn Gly Lys Leu Ile Ala Tyr Pro Ile Ala Val Glu
          100   105   110

Ala Leu Ser Leu Ile Tyr Asn Lys Asp Leu Leu Pro Asn Pro Pro Lys
      115   120   125

Thr Trp Glu Glu Ile Pro Ala Leu Asp Lys Glu Leu Lys Ala Lys Gly
    130   135   140

Lys Ser Ala Leu Met Phe Asn Leu Gln Glu Pro Tyr Phe Thr Trp Pro
145   150   155   160

Leu Ile Ala Ala Asp Gly Gly Tyr Ala Phe Lys Tyr Glu Asn Gly Lys
          165   170   175

Tyr Asp Ile Lys Asp Val Gly Val Asp Asn Ala Gly Ala Lys Ala Gly
          180   185   190

Leu Thr Phe Leu Val Asp Leu Ile Lys Asn Lys His Met Asn Ala Asp
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Thr Asp Tyr Ser Ile Ala Glu Ala Ala Phe Asn Lys Gly Glu Thr Ala
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Met Thr Ile Asn Gly Pro Trp Ala Trp Ser Asn Ile Asp Thr Ser Lys
225             230             235             240

Val Asn Tyr Gly Val Thr Val Leu Pro Thr Phe Lys Gly Gln Pro Ser
            245             250             255

Lys Pro Phe Val Gly Val Leu Ser Ala Gly Ile Asn Ala Ala Ser Pro
            260             265             270

Asn Lys Glu Leu Ala Lys Glu Phe Leu Glu Asn Tyr Leu Leu Thr Asp
        275             280             285

Glu Gly Leu Glu Ala Val Asn Lys Asp Lys Pro Leu Gly Ala Val Ala
    290             295             300

Leu Lys Ser Tyr Glu Glu Glu Leu Ala Lys Asp Pro Arg Ile Ala Ala
305             310             315             320

Thr Met Glu Asn Ala Gln Lys Gly Glu Ile Met Pro Asn Ile Pro Gln
            325             330             335

Met Ser Ala Phe Trp Tyr Ala Val Arg Thr Ala Val Ile Asn Ala Ala
            340             345             350

Ser Gly Arg Gln Thr Val Asp Glu Ala Leu Lys Asp Ala Gln Thr Asn
        355             360             365

Ser Ser Ser Asn Asn Asn Asn Asn Asn Asn Asn Asn Leu Gly Ile
    370             375             380

Glu Gly Arg Ile Ser Glu Phe Gly Ser Cys Phe Ala Ala Gly Thr Met
385             390             395             400

Val Ser Thr Pro Asp Gly Glu Arg Ala Ile Asp Thr Leu Lys Val Gly
            405             410             415

Asp Ile Val Trp Ser Lys Pro Glu Gly Gly Gly Lys Pro Phe Ala Ala
            420             425             430

Ala Ile Leu Ala Thr His Ile Arg Thr Asp Gln Pro Ile Tyr Arg Leu
        435             440             445

Lys Leu Lys Gly Lys Gln Glu Asn Gly Gln Ala Glu Asp Glu Ser Leu
    450             455             460

Leu Val Thr Pro Gly His Pro Phe Tyr Val Pro Ala Gln His Gly Phe
465             470             475             480

Val Pro Val Ile Asp Leu Lys Pro Gly Asp Arg Leu Gln Ser Leu Ala
            485             490             495

Asp Gly Ala Ser Glu Asn Thr Ser Ser Glu Val Glu Ser Leu Glu Leu
            500             505             510
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Tyr Leu Pro Val Gly Lys Thr Tyr Asn Leu Thr Val Asp Val Gly His
      515   520   525

Thr Phe Tyr Val Gly Lys Leu Lys Thr Trp Val His Asn
   530   535   540